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### **Current Version**

#### **CLAIMS**

What is claimed is:

1. (Previously Presented) A fitness function circuit for determining the fitness of a potential solution for a combinatorial genetic algorithm problem, said fitness circuit comprising:  
a solution register containing said potential solution for said genetic algorithm problem therein, said solution register comprising a plurality of component parts thereof;  
a plurality of data tables, the number of data tables corresponding to the number of said component parts of said solution register, respective data tables having inputs from two respective ones of said component parts of said solution register, each of said data tables comprising a matrix of partial solutions to said combinatorial genetic algorithm problem, the two respective ones of said component parts determining a particular respective partial solution, each of said matrices having identical entries therein; and  
an adder connected to each of said plurality of data tables, said adder adding respective partial solutions from each of said plurality of data tables, thereby determining the fitness of said potential solution for said combinatorial genetic algorithm problem.
2. (Previously Presented) The fitness function circuit according to claim 1, wherein said data tables include partial solutions specific to the sequential order of the potential solution.

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3. (Previously Presented) The fitness function circuit according to claim 1, wherein said adder adds said partial solutions from the respective data tables in parallel.

4. (Previously Presented) The fitness function circuit according to claim 3, wherein said partial solutions from the respective data tables are added substantially simultaneously.

5. (Previously Presented) The fitness function circuit according to claim 1, wherein each of said matrices within said data tables comprises an abbreviated matrix of partial solutions to said combinatorial genetic algorithm problem.

6. (Previously Presented) The fitness function circuit according to claim 5, wherein said abbreviated matrix contains at least  $(n)(n-1)/2$  entries.

7. (Previously Presented) The fitness function circuit according to claim 1, wherein at least two of the two respective ones of said component parts correspond to different entries within said matrices.

8. (Previously Presented) The fitness function circuit according to claim 7, wherein all of the two respective ones of said component parts correspond to different entries within said matrices.

9. (Previously Presented) The fitness function circuit according to claim 8, wherein said combinatorial genetic algorithm problem is the Traveling Salesman Problem.

10. (Previously Presented) A method for determining the fitness of a potential solution for a combinatorial genetic algorithm problem, said method comprising the steps of:

inputting a plurality of potential solution values into a solution register, said

solution register comprising a plurality of component parts thereof;

receiving, after said step of inputting, at each of a plurality of data tables two respective ones of said component parts of said solution register, the number of data tables

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corresponding to the number of said component parts of said solution register, each of said data tables comprising a matrix of partial solutions to said combinatorial genetic algorithm problem, each of the matrices having identical entries therein;

indexing said matrices of partial solutions to said genetic algorithm within said plurality of data tables, the two respective ones of said component parts determining respective particular partial solutions within the respective matrices; and  
adding, by an adder connected to each of the respective data tables, respective outputs from each of said data tables, whereby the sum of said adder determines the fitness of said potential solution for said combinatorial genetic algorithm problem.

11. (Previously Presented) The method according to claim 10, wherein in said step of receiving, at each of said plurality of data tables, two respective ones of said component parts of said solution register are received substantially simultaneously.

12. (Previously Presented) The method according to claim 10, wherein in said step of receiving, wherein at least two of the two respective ones of said component parts correspond to different entries within said matrices.

13. (Previously Presented) The method according to claim 12, wherein all of the two respective ones of said component parts correspond to different entries within said matrices.

14. (Previously Presented) The method according to claim 13, wherein said combinatorial genetic algorithm problem is the Traveling Salesman Problem.

15. (Previously Presented) The method according to claim 10, wherein in said step of receiving, at each of said plurality of data tables, two respective ones of said component parts of said solution register correspond to the sequential order of the potential solution values in said solution register.

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16. (Previously Presented) A methodology for determining the fitness of a particular potential solution for a

combinatorial genetic algorithm problem from a pool of potential solutions, said methodology comprising steps of:

(a) inputting a plurality of potential solution values into a solution register, said solution register comprising a plurality of component parts thereof;

(b) receiving, substantially simultaneously, at each of a plurality of data tables two respective ones of said component parts of said solution register, the number of data tables corresponding to the number of said component parts of said solution register, each of said data tables comprising a matrix of partial solutions specific to said genetic algorithm problem, each of the matrices having identical entries therein;

(c) indexing said matrices of partial solutions to said genetic algorithm within said plurality of data tables, the two respective ones of said component parts determining respective particular partial solutions within the respective matrices;

(d) adding, by an adder connected to each of the respective data tables, respective outputs from each of said data tables in parallel, whereby the sum of said adder determines the fitness of said particular potential solution for said genetic algorithm problem;

(e) comparing the fitness of said particular potential solution to a fitness threshold; and

(f) replacing a prior potential solution from said pool of potential solutions with said particular potential solution if said fitness of said particular potential solution exceeds said fitness threshold, and otherwise deleting said particular potential solution.

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17. (Previously Presented) The methodology according to claim 16, said methodology repeating said steps (a)- (f) with another particular potential solution with the same matrix of partial solutions.

18. (Previously Presented)The methodology according to claim 16, said methodology repeating said steps (a)- (f) with another particular potential solution with another matrix of partial solutions, said another matrix corresponding to partial solutions for another genetic algorithm problem.